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(54) BILL HANDLING APPARATUS

(57) A bill handling apparatus 1 is provided which comprises validator means 2 provided with sensor means 22 for validating a bill inserted into the apparatus 1; stacker means 3 for storing a bill in response to an output from the validator means 2 when the bill is considered genuine by the validator means 2; a frame 4 for supporting the stacker means 3; coupling means 10 for detachably supporting the validator means 2 to align a passageway 21 of the validator means 2 with a passageway 31 of the stacker means 3, the coupling means 10 being provided between the validator means 2 and frame 4; and connector means 60 for electrically connecting the sensor means 22 in the validator means 2 with validator control means 8 in the frame 4. When the validator means 2 is connected to the stacker means 3 by the coupling means 10 in the condition that the passageways of the validator means 2 and stacker means 3 are aligned with each other, the sensor means 22 is automatically electrically connected with the validator control means 8 positioned in the frame 4 through the connector means 60, and the conveyer means 20 in the validator means 2 is automatically drivingly connected with drive means 6 in the frame 4 through the power transmission means.

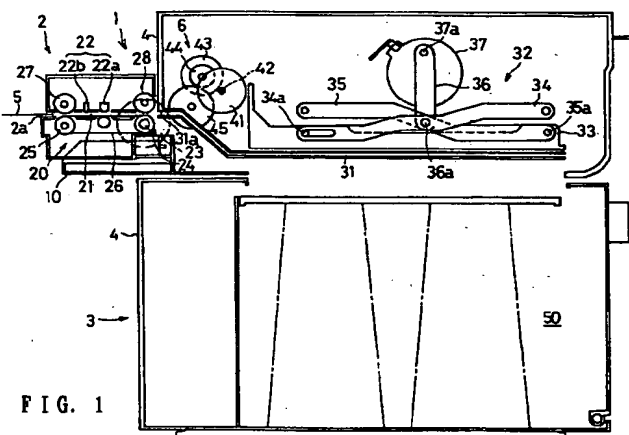


FIG. 1

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Description

This invention relates to a bill handling apparatus such as a vending machine or an automatic exchanger, in particular, to the improvement in the bill handling apparatus wherein a bill validator is attached to a frame of the apparatus and easily removed therefrom for interchange.

A prior art bill handling apparatus includes a bill validator for validating a bill and a stacker for storing bills considered valid by the bill validator. For example, Japanese Utility Model Disclosure No. 58-117568 published August 11, 1983 discloses a bill validator with which a stacker is integrally incorporated to form a shorter passageway for bill in order to manufacture the apparatus in smaller size. Also, Japanese Patent Publication No. 3-101567 published February 13, 1991 demonstrates a bill apparatus which comprises a casing; a validator disposed within the casing for validating a bill; a stacker for accumulating bills considered genuine by the validator; a L-shaped passageway formed through the validator and stacker; and a pusher for forcing a bill in the passageway into the stacker. In this prior art reference, the stacker is rotatably attached to the case to reduce the depth of the casing for the small sized apparatus.

Provided in prior art bill handling apparatus to validate a bill is a validator which is firmly and incommutably secured to a stacker so that the bill handling apparatus itself should be exchanged when a different kind of bills should be validated or when the validator has broken down.

Accordingly, an object of the present invention is to provide a bill handling apparatus which includes a validator easily and exchangeably attached thereto.

The bill handling apparatus according to the present invention comprises validator means which is provided with sensor means for validating a bill inserted into the apparatus; stacker means for storing a bill in response to an output from the validator means when the bill is considered genuine by the validator means; a frame for supporting the stacker means; coupling means for detachably supporting the validator means to align a passageway of the validator means with a passageway of the stacker means, the coupling means being provided between the validator means and frame; and connector means for electrically connecting the sensor means in the validator means with validator control means in the frame. The coupling means includes guide means provided in one of the frame and validator; pins provided in the other of the frame and validator in engaged relation to the guide means; a stopper lever rotatably provided in the frame; an abutment formed in the validator for engagement with the stopper lever; and a spring for resiliently urging the stopper lever toward the abutment to keep the engagement between the stopper lever and abutment. A slider is provided in the frame for releasing the validator from the frame by disengagement of said stopper lever from said validator.

The coupling means includes guide means provided in the frame; and pins provided in the validator in engaged relation to the guide means. The bill handling apparatus may also comprises power transmission means for drivingly connecting the drive means in the frame with conveyer means in the validator. The power transmission means comprises a drive gear of the drive means rotatably supported on the frame; and a follower gear of the conveyer means rotatably mounted on the validator for engagement with the drive gear so that the drive and follower gears are in a same plane, when the validator is connected with the stacker by the coupling means in the condition that the passageways of the validator and stacker are aligned to each other. The connector means comprises a plug of the validator sensor in the validator means and a jack in the frame, the plug and jack are in a same plane so that the plug can be inserted into the jack.

When the validator means is connected to the stacker means by the coupling means in the condition that the passageways of the validator means and stacker means are aligned with each other, the sensor means is electrically connected with the validator control means positioned in the frame through the connector means, and the conveyer means in the validator means is drivingly connected with the drive means in the frame through the power transmission means.

The foregoing as well as other objects of the present invention will become apparent during the course of the following description with reference to the accompanying drawings, in which:

Fig. 1 is a sectional view of a bill handling apparatus according to the present invention.

Fig. 2 is a side elevation view of the apparatus.

Fig. 3 is a front view of the apparatus.

Fig. 4 is a block diagram of electric circuits used in the apparatus.

Fig. 5 is a sectional view of the apparatus from which validator means has been removed.

Fig. 6 is a partial section indicating a stopper lever of coupling means which is engaged with the validator means.

Fig. 7 is a partial section of the stopper lever disengaged from the validator means.

Fig. 8 is a sectional view of the apparatus with stacker means into which a bill is forced.

Referring now to the accompanying drawings, an embodiment according to the present invention will be described hereinafter in reference to Figs. 1 to 8.

As shown in Figs. 1 to 5, the bill handling apparatus 1 according to the present invention, comprises validator means 2 for validating a bill inserted into the apparatus 1; stacker means 3 for storing a bill in response to an output from the validator means 2 when the bill is considered genuine by the validator means 2; a frame 4 for supporting the stacker means 3; coupling means 10 for detachably supporting the validator means 2. The vali-

validator means 2 comprises a conveyer means 20 for providing the passageway 21 and sensor means 22 disposed adjacent to the passageway 21 and validator control means 8 positioned in the frame 4 as shown in Fig. 4. The conveyer means 20 comprises a follower gear 23; a pulley 24 drivingly connected with the follower gear 23; at least a belt 26 wound around the pulleys 24, 25; and rollers 27, 28 rotatably mounted on the validator means 2 opposite respectively to the pulleys 24, 25. The sensor means 22 includes a magnetic sensor 22a to detect magnetic features from ferrous ink on a bill, and an optical sensor 22b to detect optical features of a bill from a light beam reflected on a surface of the bill or permeated through the bill. Disposed adjacent to an inlet 2a of the validator means 2 is an optical sensor not shown which detects insertion of a bill 5 into the inlet 2 to produce a trigger signal for activation of the conveyer means 20.

As shown in Fig. 3, the coupling means 10 is provided between the validator means 2 and frame 4 to removably support the validator means 2 on the frame 4 so that the passageway 21 of the validator means 2 is kept in aligned condition with an inlet 31a of the passageway 31 of the stacker means 31. The coupling means 10 includes guide means 13 provided in the frame 4 and a pair of pins 12 provided in the validator means 2 in engaged relation to a pair of guide grooves 11 formed on opposite sides of the guide means 13. As illustrated in Fig. 7, the coupling means 10 comprises a stopper lever 49 rotatably provided in the frame 4 by a shaft 51; an abutment 46 formed in the validator means 2 for engagement with the stopper lever 49; and a spring 47 for resiliently urging the stopper lever 49 toward the abutment 46 to keep the engagement between the stopper lever 49 and abutment 46. A slider 48 is slidably provided in the frame 4 to release the engagement of the stopper lever 49 with of the abutment 46 of the validator means 2.

The stacker means 3 is operated to store a bill 5 in response to an output of the validator means 2 which has decided that the bill 5 is genuine. The stacker means 3 comprises a pusher 32 which forcibly pushes into a storage chamber 50 the bill 5 which is conveyed along the passageway 31. The pusher 32 has a push plate 33 in contact with the bill 5; two pairs of support links 34, 35 rotatably connected with the push plate 33 by pins 34a, 35a; and a press link 36 one end of which is rotatably connected by a pin 36a with approximately central portions of the support links 34, 35. The other end of the press link 36 is rotatably connected with a disk link 37 by a pin 37a so that the press link 36 can reciprocally move in the direction perpendicular to the passageway 31 during rotation of the disk link 37.

An electric motor 41 is arranged in the frame 4 to operate drive means 6 which drives the conveyer means (not shown) in the stacker means 3 to travel the bill 5 along the passageway 31 in the frame 4, but detailed drawing is omitted. The drive means 6 comprises a pinion 42 mounted on an output shaft of the

motor 41, a first gear 43 meshed with the pinion 42, a second gear 44 secured to the first gear 43, and a drive gear 45 in engaged relation to the second gear 44 and a follower gear 23. The drive gear 45 and follower gear 23 provides a power transmission means which drivingly connects the drive means 6 in the frame 4 with the conveyer means 20 in the validator means 2. The drive gear 45 is rotatably supported on the frame 4, and the follower gear 23 is rotatably mounted on the validation means 2.

As shown in Fig. 4, provided between the validator means 2 and frame 4 is connector means 60 which comprises a plug 61 provided in the validator means 22 and a jack 62 in the frame 4 so that the plug 61 can be inserted into the jack 62 to electrically connect the sensor means 22 in the validator means 2 with validator control means 8 in the frame 4. When the validator means 2 is connected with the stacker means 3 by the coupling means 10, the passageways 21, 31 of the validator means 2 and stacker means 3 are retained in the aligned condition to each other. Simultaneously, the drive gear 45 of the drive means 6 in the frame 4 and the follower gear 23 of the conveyer means 20 in the validator means 2 are aligned to each other in a same plane. Also, the plug 61 of the validator means 2 and the jack 62 in the frame 4, are positioned in a same plane.

As understood from Fig. 4, the validator control means 8 comprises discriminating means 8a connected with the jack 62, and drive control means 8b connected with the discriminating means 8a to receive control signals from the discriminating means 8a. Also, the drive control means 8b is connected with a conveyer drive circuit 63 and a stacker drive circuit 64 to supply drive signals. In addition, the drive control means 8b is connected with an encoder 65 for recognition of moved position of the bill 5, a home position sensor 66 for detecting a retracted position of the push plate 33 and other sensors 67 so that the drive control means 8b may receive signals from the encoder 65 and sensors 66, 67.

When the validator means 2 is connected with the stacker means 3 by the coupling means 10 in the condition that the passageways 21, 31 of the validator means 2 and stacker means 3 are in the aligned condition to each other, the sensor means 22 of the validator sensor 22 in the validator means 2 can automatically and electrically be connected with the validator control means 8 through the connector means 60, and the conveyer means 20 in the validator means 2 can automatically be connected with the drive means 6 in the frame 4 through the drive gear 45 of the drive means 6 in the frame 4 and the follower gear 23 of the conveyer means 20 to transmit driving power from the drive means 6 to the conveyer means 20.

To exchange the validator means 20 with another one, the slider 48 is manually pushed toward the stopper lever 49 so that the stopper lever 49 is rotated around the shaft 51 against the resilient force of the spring 47 to release the engagement of the stopper lever 49 from the abutment 46 of the validator means 2.

At this time, when the validator means 2 is pulled before, the pins 12 moves along the guide grooves 11 of the coupling means 10 to finally remove the validator means 2 outward from the frame 4 for exchange. When another validator means 2 is attached instead to the frame 4, the pins 12 are received within the guide grooves 11 and the validator means 2 is traveled inward and along the guide grooves 11 while the slider 48 is manually pushed. When the validator means 2 is pushed along the guide grooves 11 to enough depth, manual force is removed from the slider 48.

When a bill 5 is inserted into the inlet 2 of the validator means 2, the insertion of the bill 5 is detected by operation of the above-mentioned optical sensor which then produces an output. The validator control means 8 receives the output from the optical sensor and activates the motor 41 to drive the drive means 6. Consequently, the pinion 42, the first and second gears 43, 44, the drive gear 45 and follower gear 23 are rotated in turn to drive the conveyer means 20 so that the bill 5 is carried into the validator means 2. The validator control means 8 receives detection signals from the validator sensors 22, and decides whether the bill 5 is genuine or not. When the validator control means 8 has decided that the bill 5 is not genuine, it drives the motor 41 in the reverse direction to return the bill 5 to the inlet 2a. When the validator control means 8 has decided that the bill 5 is genuine, it continues to produce the drive signal to the motor 41 in the forward direction so that the conveyer means 20 is activated to travel of the bill 5 through the passageways 21 and 31 beneath the push plate 33 of the pusher 32. At this stage, the disk link 37 is rotated and the press link 36 is forcibly moved downward so that the support links 34, 35 are rotated from the retracted position of Fig. 1 to the extended position of Fig. 8 to store bills in the storage chamber 50 in the accumulated condition.

This embodiment of the instant invention produces the following effects:

- (1) The validator means 2 can easily be exchanged.
- (2) The validator means 2 without motor can be manufactured in light weight and small size for easy handling and maintenance.
- (3) Other kinds of bills can be validated by exchange of the validator means 2 with another one. ROM (Read Only Memory) can be exchanged to alter the data processing for the discrimination of the bill
- (4) The single motor 41 is available to drive conveyer means 20 of the validator means 2 and stacker means 3 to manufacture the bill handling apparatus 1 in small size and at reduced cost.

Modes of the present invention may be varied in view of actual demands without limitation to the foregoing embodiment. For example, the conveyer means 20 and the disk link 37 can be driven by the single motor 41 in the different rotational direction. The pins 12 can be

provided in the frame 4, while the guide means 13 can be provided in the validator means 2 to receive the pins 12. Another motor than the motor 41 may be provided in the validator means 2 to drive the conveyer means 20 by electric power supplied through the connector means 60 from power source. A part of the validator control means 8 may be disposed in the validator means 2 not in the frame 4.

As mentioned hereinbefore, the present invention realizes that validator means can easily be removed from the bill handling apparatus to replace with another one for easy maintenance and inspection of the validator means. In addition, the bill handling apparatus can readily respond to validate other kinds of bills or change of model or to accommodate to the modified specification of design.

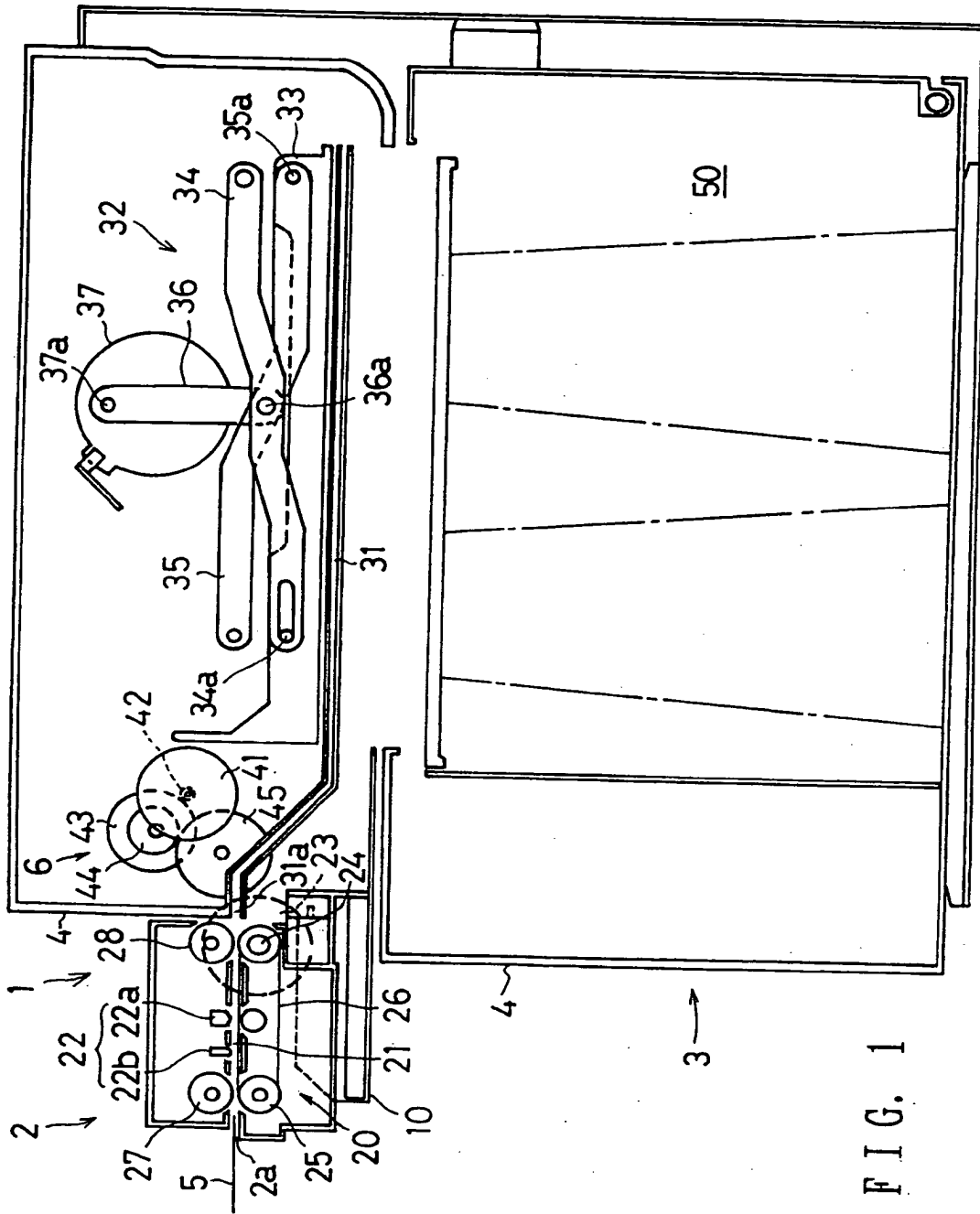
Claims

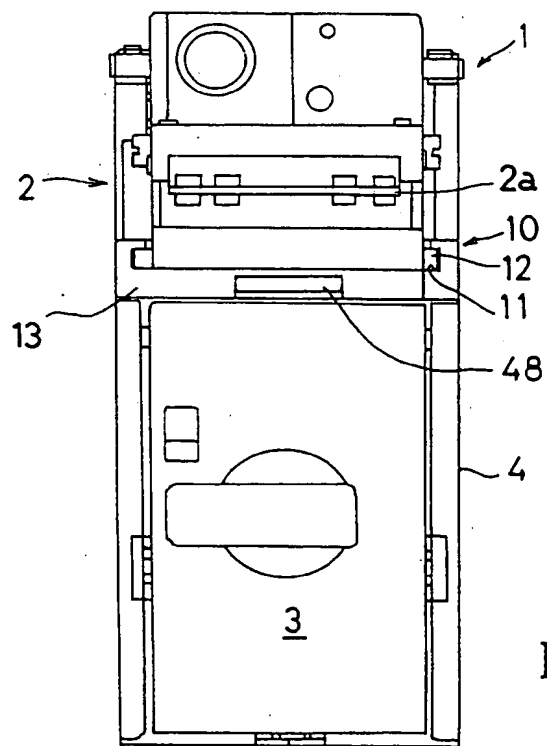
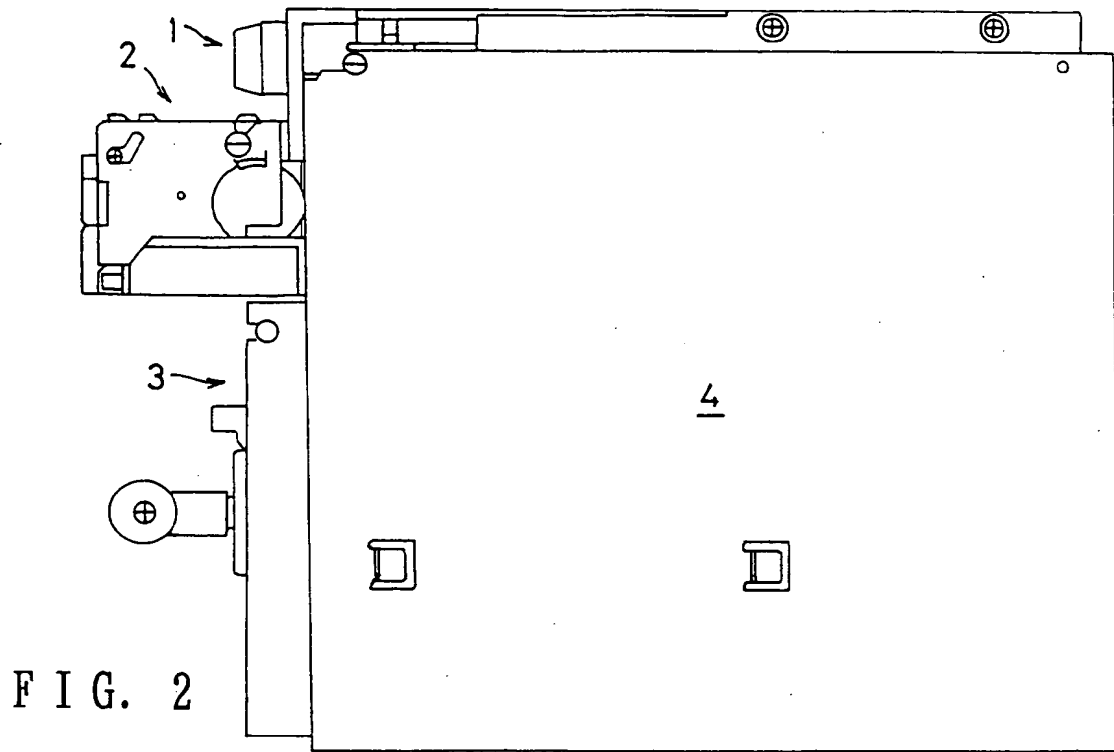
1. In a bill handling apparatus including validator means which is provided with sensor means for validating a bill inserted into said apparatus; stacker means for storing a bill in response to an output from said validator means when the bill is considered genuine by said validator means; and a frame for supporting said stacker means, the improvement comprising:

coupling means for detachably supporting said validator means to align a passageway of said validator means with a passageway of said stacker means, said coupling means being provided between said validator means and frame; connector means for electrically connecting said sensor means in said validator means with validator control means in said frame.

2. A bill handling apparatus as defined in claim 1, wherein said coupling means includes guide means provided in one of said frame and validator; and pins provided in the other of said frame and validator in engaged relation to said guide means.
3. A bill handling apparatus as defined in claim 1, wherein said coupling means includes a stopper lever rotatably provided in said frame; an abutment formed in said validator for engagement with said stopper lever; and a spring for resiliently urging said stopper lever toward said abutment to keep the engagement between said stopper lever and abutment.
4. A bill handling apparatus as defined in claim 3, wherein a slider is provided in said frame for releasing the validator from the frame by disengagement of said stopper lever from said validator.
5. A bill handling apparatus as defined in claim 1, wherein said coupling means includes guide means

- provided in said frame; and pins provided in said validator in engaged relation to said guide means.
6. In a bill handling apparatus including validator means which is provided with sensor means for validating a bill inserted into said apparatus; stacker means for storing a bill in response to an output from said validator means when the bill is considered genuine by said validator means; and a frame for supporting said stacker means, the improvement comprising:
- coupling means for detachably supporting said validator means to align a passageway of said validator means with a passageway of said stacker means, said coupling means being provided between said validator means and frame; power transmission means for drivingly connecting drive means in said frame with conveyer means in said validator; and connector means for electrically connecting said sensor means in said validator means with validator control means in said frame.
7. A bill handling apparatus as defined in claim 6, wherein said coupling means includes guide means provided in one of said frame and validator; and pins provided in the other of said frame and validator in engaged relation to said guide means.
8. A bill handling apparatus as defined in claim 6, wherein said coupling means includes a stopper lever rotatably provided in said frame; an abutment formed in said validator for engagement with said stopper lever; and a spring for resiliently urging said stopper lever toward said abutment to keep the engagement between said stopper lever and abutment.
9. A bill handling apparatus as defined in claim 8, wherein a slider is provided in said frame for releasing the validator from the frame by disengagement of said stopper lever from said validator.
10. A bill handling apparatus as defined in claim 6, wherein said coupling means includes guide means provided in said frame; and pins provided in said validator in engaged relation to said guide means.
11. A bill handling apparatus as defined in claim 6, wherein said power transmission means comprises a drive gear rotatably supported on said frame; and a follower gear rotatably mounted on said validator for engagement with said drive gear.
12. A bill handling apparatus as defined in claim 6, wherein said connector means comprises a plug and a jack into which said plug is inserted.
13. A bill handling apparatus as defined in claim 6, wherein said power transmission means comprises a drive gear of said drive means in said frame and a follower gear of said conveyer means in said validator, said drive and follower gears are located in a same plane, when said validator means is connected with said stacker means by said coupling means in the condition that said passageways of said validator means and stacker means are aligned to each other, said connector means comprises a plug of said validator sensor in said validator means and a jack in said frame, said plug and jack are in a same plane.





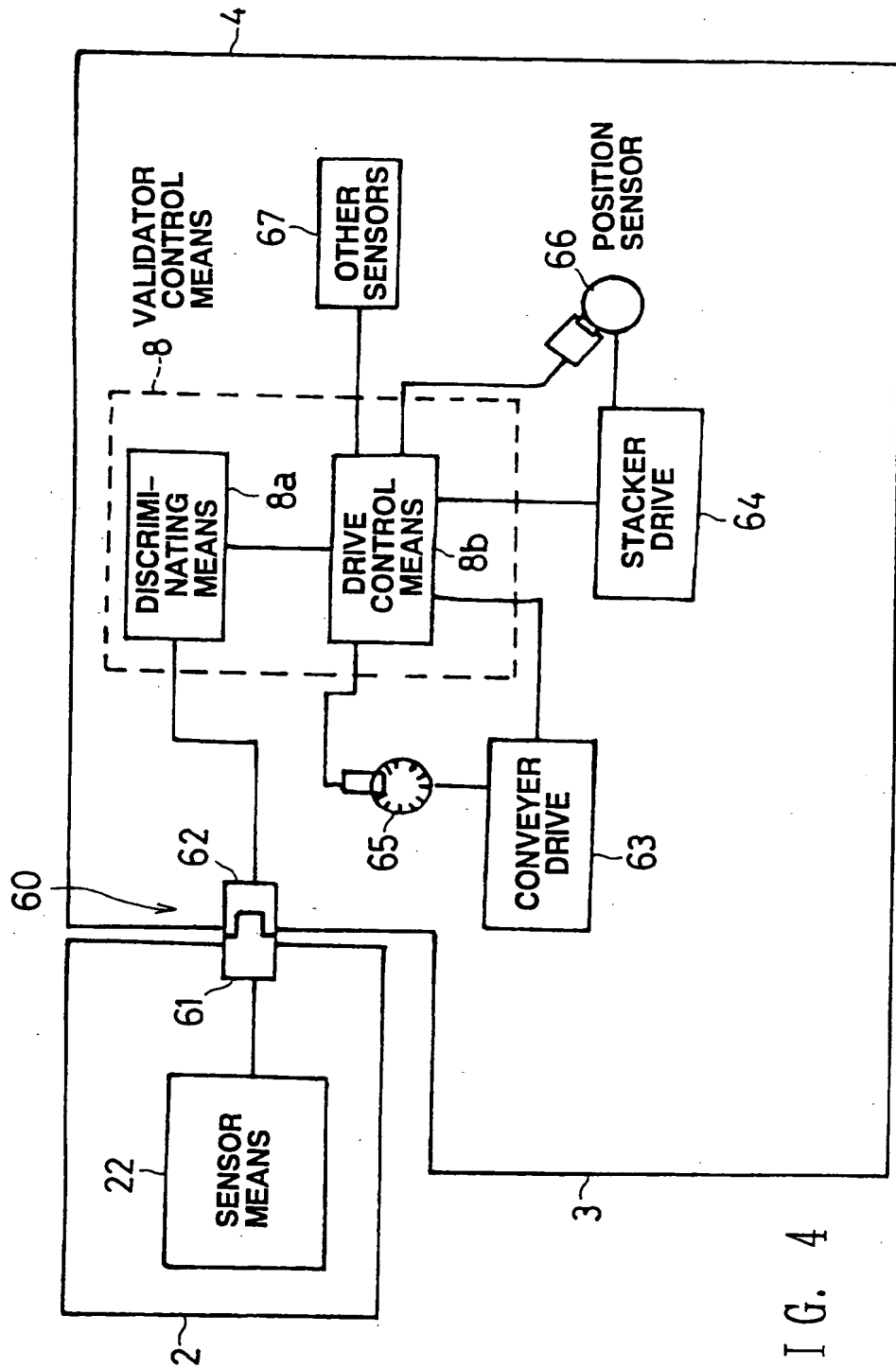


FIG. 4

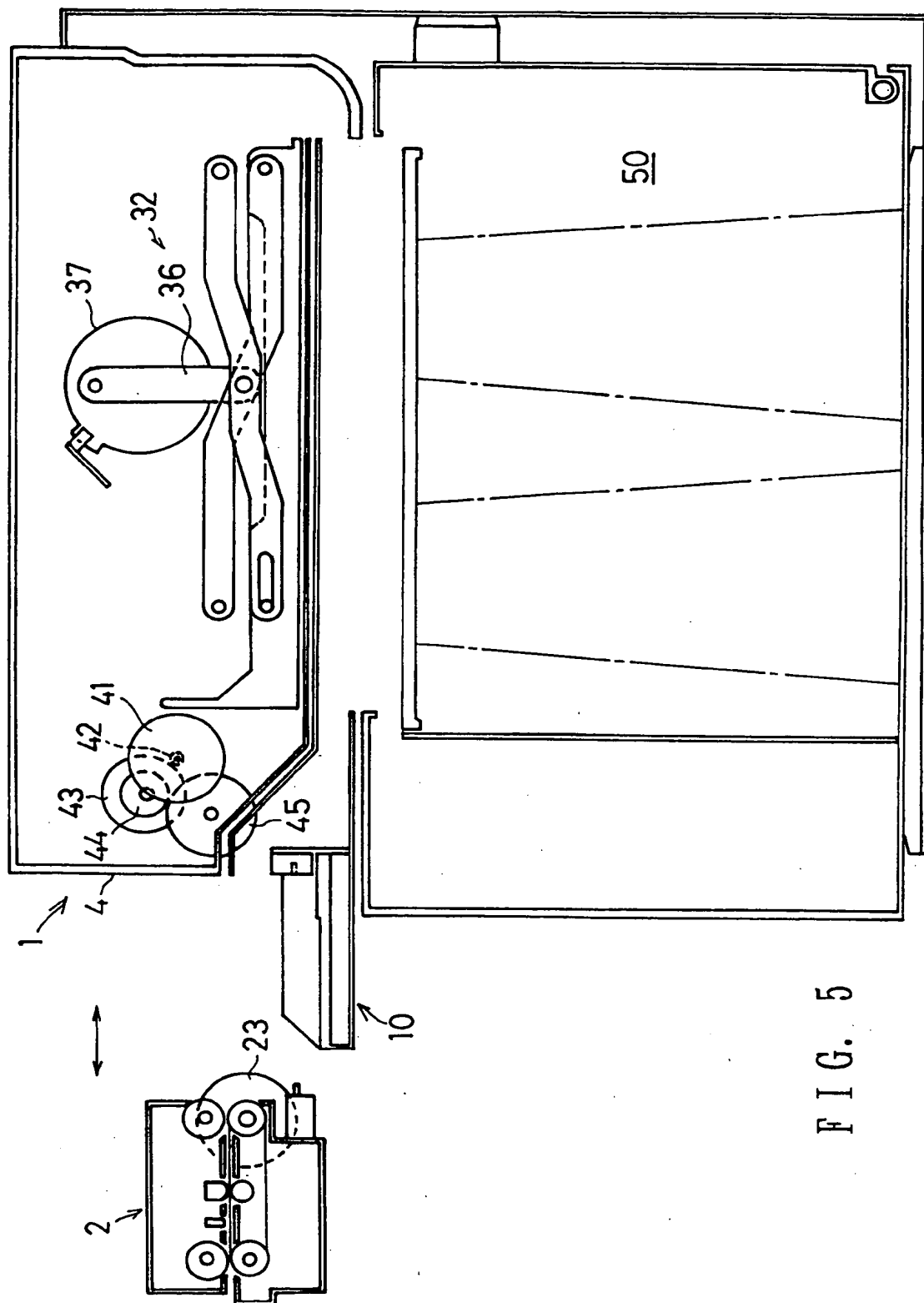


FIG. 5

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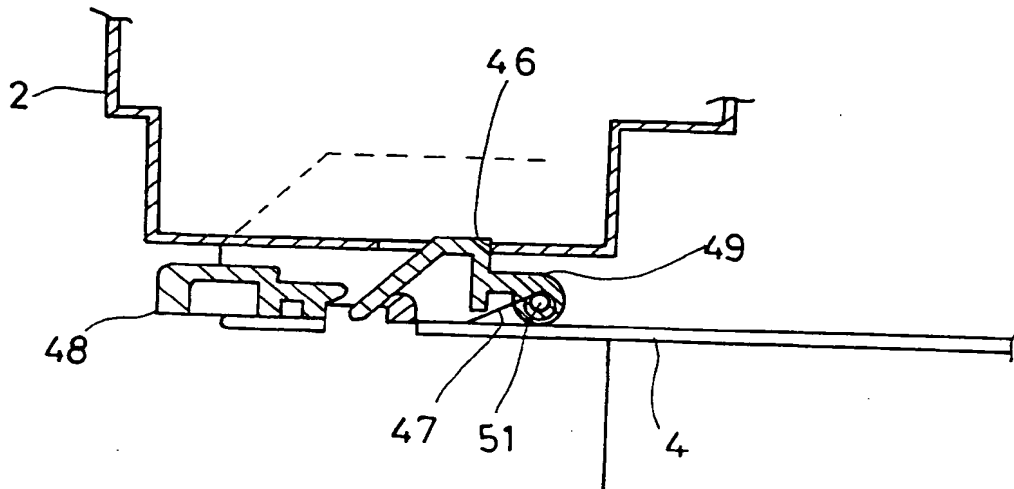


FIG. 6

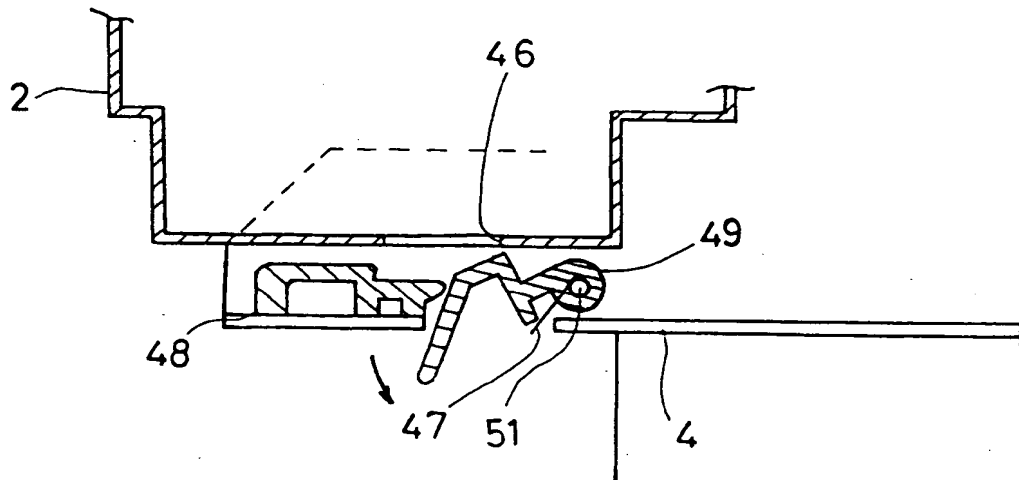


FIG. 7

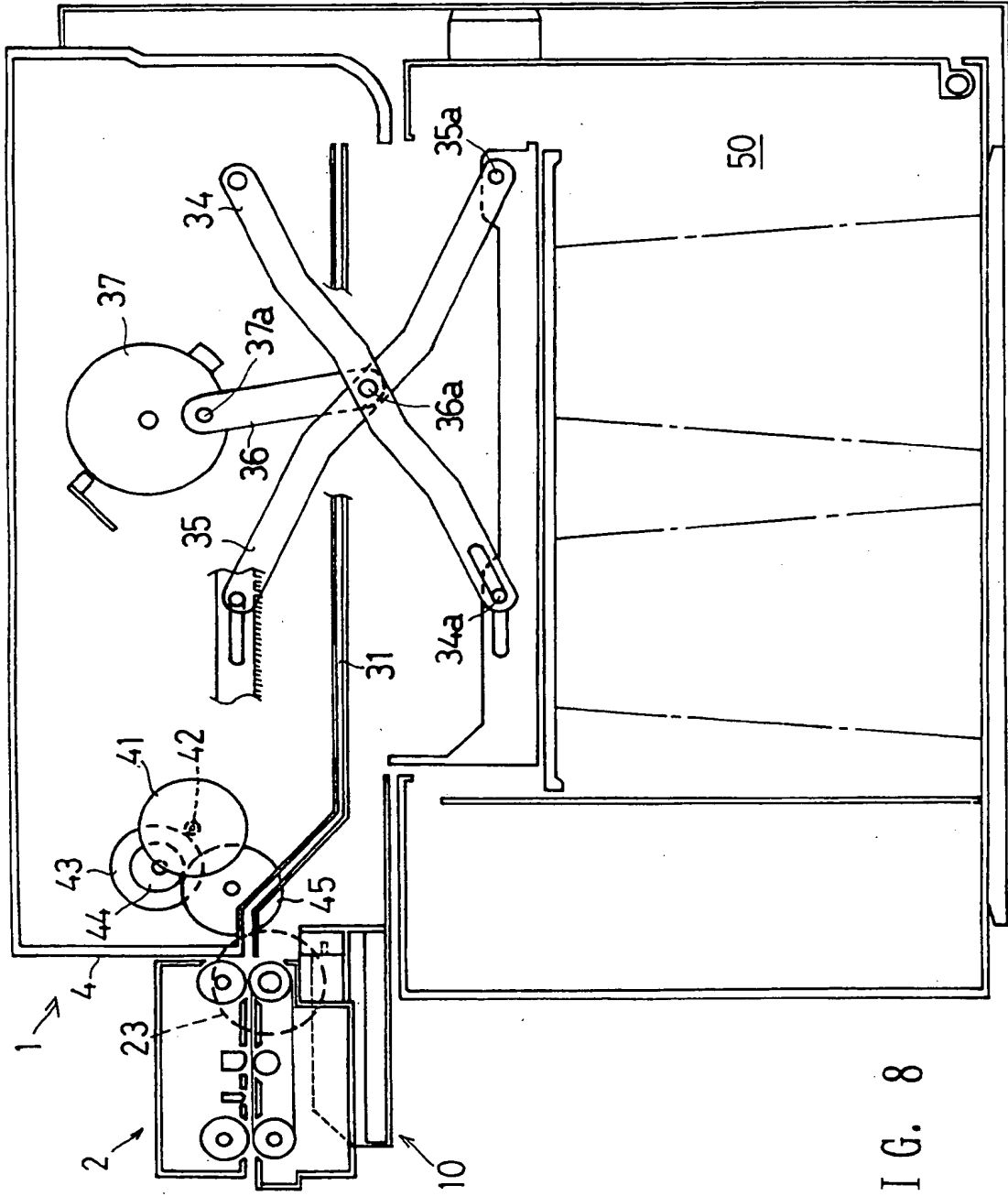


FIG. 8

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP96/00562

A. CLASSIFICATION OF SUBJECT MATTER		
Int. Cl ⁶ G07D9/00		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED		
Minimum documentation searched (classification system followed by classification symbols)		
Int. Cl ⁶ G07D7/00, G07D9/00, G07F7/04		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Jitsuyo Shinan Koho 1926 - 1996 Kokai Jitsuyo Shinan Koho 1971 - 1996 Toroku Jitsuyo Shinan Koho 1994 - 1996		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP, 57-44431, Y2 (Omron Corp.), October 1, 1982 (01. 10. 82) (Family: none)	1 - 13
Y	JP, 60-10370, U (Microfilm) (Fujitsu Ltd.), January 24, 1985 (24. 01. 85) (Family: none)	1 - 13
Y	JP, 63-211099, A (Japan Cash Machine Co., Ltd.), September 1, 1987 (01. 09. 87) (Family: none)	1 - 13
<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/> See patent family annex.		
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Date of the actual completion of the international search May 1, 1996 (01. 05. 96)		Date of mailing of the international search report May 14, 1996 (14. 05. 96)
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.		Authorized officer Telephone No.

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